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FLOOD PLAIN MANAGEMENT STUDY CROW CREEK AND BENGIS CREEK IN VICINITY OF STEVENSON, ALABAMA

Prepared By

U.S. Department of Agriculture
Soil Conservation Service
Auburn, Alabama

In Cooperation With

City of Stevenson, Alabama

Jackson County Soil and Water Conservation District

Top of Alabama Regional Council of governments

State of Alabama
Alabama Department of Economic and Community Affairs

with Assistance By
The Tennessee Valley Anthority

November 1984

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Acknowledgements:

The cooperation and assistance given by the agencies, organizations, and industries during these flood hazard analyses are greatly appreciated. These include:

City of Stevenson

Jackson County Soil and Water Conservation District

Top of Alabama Regional Council of Governments (TARCOG)

U.S. Geological Survey, Department of Interior (USGS)

Alabama Department of Economic and Community Affairs (ADECA)

Tennessee Valley Authority

Appreciation is also extended to the many local officials and individuals who contributed information for the study and to landowners who permitted access for engineering surveys and field studies.

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FOREWORD

Pressures created by increased urbanization have intensified the demand to use flood plain areas in and adjacent to Stevenson, Alabama. Technical information about flood hazards is essential for a local flood plain management program to be effectively planned and implemented.

This report provides flood hazard information for 15 stream miles along Crow Creek, Bengis Creek and its tributary. The total drainage areas at the lower study limits of Crow Creek Watershed, Bengis Creek and its tributary are 157.0, 14.3, and 1.6 square miles respectively. The report includes Flood Hazard Area Photomaps and Flood Profiles for these streams. Also, Flood Hazard Photomaps have been developed by an approximation method on Crow Creek from the downstream detailed study limit (9.97 miles above mouth at Guntersville Lake) downstream to mile 5.0. Land use management practices and corrective measures that would minimize the risk of flooding are also discussed in the report.

Identification of the major flood-prone areas, history of flooding, and pertinent State statutory authority and local flood-prone area land use management practices are contained in the report. State and local governmental units will find this information valuable in assessing flood problems and determining actions needed for the wise use of lands adjacent to the flood plain.

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INTRODUCTION

The City of Stevenson requested a flood plain management study to identify local flood problems and to encourage wise uses of the flood-prone area commensurate with the flood hazard. This study was conducted in accordance with a plan of study developed in August 1982 by the Soil Conservation Service (SCS), the Alabama Department of Economic and Community Affairs (ADECA), and the City of Stevenson. Soil Conservation Service flood plain management studies in Alabama are carried out through an April 1983 Joint Coordination Agreement between the SCS and ADECA. Data in this report are based on investigations and analyses performed by SCS in cooperation with ADECA, the City of Stevenson, the Top of Alabama Regional Council of Governments (TARCOG), the Tennessee Valley Authority (TVA), and the Jackson County Soil and Water Conservation District (Jackson Co. SWCD).

Soil Conservation Service flood plain management studies are conducted under the authority of Section 6 of Public Law 83-566, in response to Federal Level Recommendation No. 3 of Water Resources Council revised Unified National Program for Flood Plain Management, September 1979; and in compliance with Executive Order 11988, dated May 24, 1977. Section 11-52-1 through 11-52-84, the Code of Alabama 1975, as amended, provides the zoning authority for municipalities to develop land use controls. Sections 11-19-1 through 11-19-24 of the Code of Alabama 1975, as amended, contains authority for development of a comprehensive land management and use program in unincorporated flood prone areas of the State. It allows county commissions in Alabama to meet requirements of the National Flood Insurance Act of 1968 (as amended), and authorizes the county commissions to prescribe criteria for land management and use in

flood-prone areas.

The objective of this flood plain management study is to furnish needed technical data to local governments so they can prevent potential flood losses that might be caused by unwise development in flood-prone areas.

Information on the possibility of future floods of various magnitudes and the extent of flooding which might occur is included for Crow Creek, Bengis Creek and its tributary within and adjacent to the City of Stevenson, Alabama. The extent of potential flooding from the 100-year and 500-year floods are shown on aerial photomaps. Elevation of expected flooding for selected recurrence intervals (10-, 50-, 100-, and 500-year events) are provided on flood profiles for the streams studied (Appendix B). Also, information is provided to indicate that portion of the flood plain which is within the floodway. (See "Glossary of Terms" in Appendix C for detailed definitions of terms used in the report.)

By using the maps, tables, and profiles presented in this report, areas flooded, floodway area, and flood elevations at selected locations along the streams may be determined. This information will permit local units of government to implement flood plain manangement regulations which recognize potential flood hazards.

The maps and profiles are based on conditions that existed at the time field surveys were made in 1982. Such factors as increased urbanization, encroachment of flood-prone areas, relocation or modification of bridges and other stream crossings, and stream channel improvement can have a significant effect

on flood stages and areas inundated. Therefore, the results of any flood hazard analysis should be reviewed periodically by appropriate State and local officials and planners to determine if changes in watershed conditions would significantly affect future flood elevations.

The Soil Conservation Service through the Jackson County SWCD, ADECA, and the Top of Alabama Regional Council of Governments can provide technical assistance in the interpretation and use of the information contained herein and will provide additional technical assistance and data needed in local flood plain management programs.

DESCRIPTION OF STUDY AREA

General

The City of Stevenson is located in Jackson County, Alabama, within the Tennessee River Basin (USGS Hydrologic Unit Code 06030001-060). The study area includes flood-prone areas of Crow Creek, Bengis Creek and its tributary within and adjacent to the City of Stevenson (LOCATION MAP, Appendix A, Sheet 1). They are perennial streams influenced in the lower reaches by backwater from the Tennessee River and Guntersville Lake. Crow Creek flows into Guntersville Lake at Tennessee River mile 401.2 and drains a total area of 275.0 square miles at its mouth and 157 square miles at the lower detailed study limit, mile 9.97. In addition to the Crow Creek detailed study area (mile 9.97 to 11.87), the reach of Crow Creek from mile 5.0 to 9.97 was studied by approximation. Above the Bengis Creek lower study limit at Highway 117, the watershed drains an area of 14.3 square miles. The tributary to Bengis Creek drains an area of 1.60 square miles at its lower study limit at Highway 72.

Jackson County had a population of 51,407 in 1980. Stevenson, with a 1980 population of 2,568 experienced an 8 percent growth in the 1970-80 decade. The ADECA has projected the city's population to increase to 3,750 by 2000. The area of incorporation, at present, is approximately 5.4 square miles and the incorporated area subject to inundation by the 100-year flood is 1.3 square miles.

In general, temperatures are mild to warm with few extended periods of subfreezing weather. Sub-freezing temperatures, while not uncommon, are usually of short duration. Rainfall amounts and runoff characteristics vary on a seasonal basis, with normal rainfall for winter and spring being greater than summer and autumn. Because of this seasonal distribution of rainfall, most major floods occur in late winter or in early spring. The average annual snowfall is 4 inches. The normal frost-free period is from about April 10 to October 30, about 210 days.

TABLE 1
AVERAGE TEMPERATURE AND RAINFALL*

Season	Temperature (Degrees Fahrenheit)	Rainfall (Inches)
Winter	41.2	16.3
Spring	59.3	13.2
Summer	76.8	12.7
Fall	60.4	12.6
Yearly Average 1951-80	59.4	54.8

*Climatography - No. 81, Alabama (NOAA, Department of Commerce)

Geology and Topography

The study area is in the Cumberland Plateau section of the Appalachian Plateau physiographic province. Three distinct topographic features are recognizable;

sandstone plateaus, rough mountain slopes, and limestone valleys. The wide limestone valleys are the area of interest in this study. Bengis Creek and Crow Creek occupy wide, gently rolling valleys developed on nearly flat-lying limestones. Flood plains, within these valleys, are wide flat areas along the creeks and around the upper reaches of the Crow Creek arm of Guntersville Reservoir.

Flood plain elevations range from 595 feet above mean sea level (msl) at Guntersville Reservoir to about 610 feet msl upstream along Bengis Creek. Difference in elevation between the plateaus and valleys range from 800 to 1000 feet. This elevation change usually occurs within one half mile horizontally. Runoff is rapid and flooding occurs often and quickly.

The geologic formations of the plateaus in the vicinity are the Gizzard Group and the Sewanee conglomerate of Pennsylvanian Age. These formations consist of shales, sandstones, coal, and conglomeritic sandstone. Coal is not found within the study area. Geologic formations of the mountain slopes and valleys are the Pennington Formation, Bangor Limestone and Monteagle Limestone of Mississippian Age. The rocks are generally level bedded except near the Tennessee River where they are upturned along the northwest flank of the Sequatchie Anticline.

Soils

The soils within the 100-year flood hazard area formed in loamy and clayey alluvium and colluvium on flood plains and stream terraces. Soils most frequently flooded are the Dunning, Lindside, Melvin, Pope, and Sturkie soils. Adjacent moderately-well drained to somewhat poorly drained soils also subject

to flooding are the Capshaw, Colbert, Monongahela, Taft, and Tupelo soils. Adjacent well-drained soils subject to rare flooding or no flooding are the Allen, Jefferson, Sequatchie, and Waynesboro soils. Small areas of limestone derived soils on the Cumberland Plateau are within the study area.

Dunning, Lindside, Melvin, Pope, and Sturkie soils make up about 40 percent of the flood hazard area and are on the lower elevations. These deep, poorly-drained to well-drained soils are occasionally flooded. These soils are fairly well suited to cultivated crops and well suited to pasture, hay, and woodland. Flooding and wetness are the main limitations to building site development and to the construction of sanitary facilities.

Capshaw, Colbert, Monongahela, Taft, and Tupelo soils make up about 40 percent of the flood hazard area and are on the intermediate elevations. These deep, moderately well-drained to somewhat poorly-drained soils are rarely to occasionally flooded. These soils are well suited to cultivated crops, pasture and hay, and woodland. Flooding and wetness are the main limitations to building site development and to the construction of sanitary facilities.

Allen, Jefferson, Sequatchie, and Waynesboro soils make up about 20 percent of the flood hazard area and are on the higher elevations. These deep, well-drained soils are rarely flooded. These soils are well suited to cultivated crops, pasture and hay, and woodland. Except where there is a flooding hazard, building site development and the construction of sanitary facilities are not limited.

Limestone derived soils, colluvial soils, and the Allen and Jefferson soils are

on uplands adjacent to the study area. These shallow to deep, well drained to somewhat poorly drained soils do not flood. These are well suited to poorly suited to cultivated crops, woodland, and pasture and hay. Suitability is slope dependent. Building site development and the construction of sanitary facilities are also limited by slope.

If detailed soils information is desired for a specific location, the Jackson County Soil and Water Conservation District or personnel in the Soil Conservation Field Office in Scottsboro should be consulted.

Approximately 80 percent of the flood hazard area and approximately 60 percent of the adjacent uplands qualify for prime farmland as defined in the "Glossary of Terms."

NATURAL VALUES

Land Use

The present land use in the Crow Creek Watershed consists of cropland (7 percent), pasture (5 percent), urban and built-up areas (1 percent), forest (85 percent); the remaining land is miscellaneous use (2 percent). The present land use in the Bengis Creek Watershed consists of cropland (20 percent), pasture (12 percent), urban and built-up areas (6 percent), forest (60 percent); the remaining land is miscellaneous use (2 percent). The flood plain land use of the study area is as follows: urban (12 percent), cropland (28 percent), pasture (10 percent), forest (20 percent), recreation and other (5 percent), and water management (25 percent).

Plant Resources

Portions of the area addressed in this flood plain management study are affected by the Tennessee River and the TVA impoundment, Guntersville Lake. Much of the historic flood plain is now permanently inundated by Guntersville Lake. The remaining portions of the flood plain are narrow reaches along tributaries.

Prior to man's advent the area was a mixed mesophytic forest. Tree species characteristic of this forest include white, red, and Meuhlenberg oaks; slippery, American, and September elms; shagbark hickory; American ash; American chestnut; black locust; sugar and red maples; blackgum; sweetgum; basswood; American beech; cucumber tree; tulip; butternut; and black walnut.

Northeastern Alabama is the southernmost limit of this forest type in the Eastern United States. This forest is restricted to the Cumberland Plateau and Highland Rim being well developed on calcareous soils. A number of plant species, especially herbs, are at the southernmost limit of their range in this forest. The State of Alabama has listed as endangered 10 species of plants, 9 species as threatened, and 25 as species of special concern. The U. S. Government has listed as endangered the green pitcher plant, *Sarracenia oreophila*. All of these species occur in Jackson County and many, if not most, would occur in the mixed mesophytic forest.

The mixed mesophytic forest is one of Alabama's more sensitive deciduous forest types. Vegetation removal, inundation due to impoundments, and conversion to farmland are all adverse activities which have affected this forest type.

Fish and Wildlife

The mixed mesophytic forest provided habitat for several game and non-game species of wildlife. Game species included the whitetail deer, wild turkey, gray squirrel, rabbits, and, to some extent the bobwhite quail. Furbearers found in this forest include oppossum, raccoon, bobcat, beaver, mink, and muskrat. Other animal populations supported by this forest include amphibians, reptiles, and many species of non-game birds.

The major species of game fish in the study area include bluegill, largemouth bass, smallmouth bass, longear sunfish, black and white crappie, white bass, and striped bass hybrids. The so-called rough fish species include the catfish, bullheads, gar, suckers, carp, buffalo, and shad.

Wetland types (U.S. Department of the Interior, Fish & Wildlife Service Circular 39) associated with the study area are 1 and 6. Type 1 makes up the bulk of the wetland area with some Type 6 occurring on the smaller, perennial streams due primarily to beaver activity.

Archeological, Historical, and Natural Values

There are seven places of historic significance listed for Jackson County. Four of these occur in Stevenson. There are 71 historic landmarks in Jackson County. There are 183 sites of archeological importance in Jackson County. However, none of these historic archeological sites will be affected by application of any of the flood plain management alternatives presented in this study.

Urban growth and clearing of the mixed mesophytic forest in the study area has

drastically altered the natural values. Much of the area is now in open fields or pasture with some urban build-up in the City of Stevenson where grass and herbaceous growth has replaced much of the woody vegetation.

FLOOD PROBLEMS

Historical Floods

Damaging floods have occurred several times in the past on the Tennessee River. Major floods occurred in 1867, 1957, 1963, and 1973. Of these, the flood in 1867 was the greatest. The most recent major flood occurred in March 1973 with a flood elevation of 609 feet-msl on Crow Creek at Mile 10. This flood resulted in an elevation of 612.6 feet-msl on Bengis Creek mile 2.9. Damages occur to both residential and commercial property from these large flood producing storms (Appendix A, Flood Hazard Area Maps).

Flood-producing storms may occur at any time of the year but are more numerous during winter and early spring. Winter storms are generally of the frontal type lasting 2 to 4 days and cover a large area. Occassionally some summer disturbances are associated with the passage of hurricanes or tropical storms. The 100-year flood was selected to best reflect the present flooding problems. This flood is defined as the flood which has 1 chance in 100 (1 percent) of being equaled or exceeded in any given year. However, floods larger than the 100-year have occurred in the study area and will occur again in the future.

Future Floods

The areas that are subject to damage by flooding along the two streams include commercial, agricultural, and residential developments along with associated roads, streets, and utilities. Approximately 3,175 acres in the study area are

subject to damage by the 100-year flood.

TABLE 2
STREAM MILEAGE AND AREA FLOODED
(100-YEAR FLOOD)

Stream Reach	Miles	Area Flooded (Acres)
Crow Creek	8.8	2164
Bengis Creek	4.8	947
Tributary to Bengis Creek	1.4	64
Total	15.0	3175

Future development of remaining open spaces in the flood plain should be considered only if potential flood damage can be eliminated or held to acceptable minimums. A knowledge of the flood potential and hazard is important in land use planning and for management decisions concerning flood plain utilization. This report identifies those areas that are subject to possible future floods. Special emphasis is given to these floods through maps, photographs, and profiles. This report does not provide solutions to flood problems; however, it does furnish a suitable basis for the adoption of land use management practices to guide flood plain development.

The areas along Crow Creek, Bengis Creek and its tributary which would be flooded by the 100-year and 500-year floods are shown on Flood Hazard Area Photomaps, Scale 1" = 800' (Appendix A, sheets 1 through 5). The Location Map and Photomap Index in Appendix A shows the location and area covered by individual photomaps.

The actual limits of these overflow areas may vary somewhat from those shown

because the contour interval and scale of the base maps do not permit precise plotting of the flood area boundaries. A more exact determination of the depth of flooding by the 100-year and 500-year floods at any particular point along the streams can be determined from the water surface profiles and the ground elevation at the point in question. To determine the depth of flooding or the height of land above the flood, the following steps should be followed:

1. Determine the stream mileage to the point in question.
2. Read the flood elevation for this mileage from the water surface profiles.
3. Determine the ground elevation at the point in question.
4. Compare the flood height with the ground elevation to compute the depth of flooding or the height of land above the flood.

TABLE 3
FLOOD ELEVATIONS

Location	Mile	Frequency 10-Year Feet-MSL	50-Year Feet-MSL	100-Year Feet-MSL	500-Year Feet-MSL
		Crow Creek			
Lee Highway (U.S. 72)	3.7	603.9	605.5	606.5	609.6
Mouth Bengis Creek	5.0	604.0	605.7	606.9	610.2
L&N Railroad	9.9	604.3	607.1	609.1	613.3
		Bengis Creek			
Highway 117	0.8	604.0	605.7	606.9	610.2
Old Mt. Carmel Rd.	2.5	608.2	609.4	610.0	611.6
Second Street	2.9	610.7	612.6	613.9	614.2
	Tributary to Bengis Creek at Mile 2.07				
Highway 72 By-Pass	0.4	610.2	610.7	610.9	611.2

Floodways

Encroachments in the flood plain such as fills or structures reduce its flood-carrying capacity and increase the danger of flooding in other areas. In

reviewing flood plain development proposals, the economic gain of the proposed development must be compared to the possibility of increased flood damage both to the development and to existing neighboring developments. The community must decide how much additional flood plain development to allow, what the effects of such development will be, and where the development should take place. Since the community is particpating in the National Flood Insurance Program (NFIP), it must zone flood-prone areas so that further development will not result in an increase in the existing level of the 100-year flood by more than 1 foot at any point along the stream.

To accommodate some flood plain development, the flood plain can be divided into two separate parts -- the floodway and the flood fringe. This division recognizes the natural functions of the flood plain. The floodway is the stream channel and that portion of the adjacent flood plain which must remain open and unobstructed to permit passage of floodwaters. The floodwaters are deepest and swiftest in the floodway, and structures and other uses located in this area are subject to the greatest danger and damage during times of flooding. The remainder of the flood plain is called the flood fringe. Here the water is shallower and may have little or no movement. Therefore, most communities permit development in this portion of the flood plain if the development is elevated or otherwise protected to an established (usually 100-year) flood level.

While a community may have some flexibility in setting limits, a floodway must be determined which is capable of handling the maximum expected flow of a design flood. When making this determination, it is assumed that the community will permit development in the remainder of the flood plain (that is, in the

flood fringe) and that ultimately total development of the flood fringe will occur, thereby restricting water from flowing through the developed area.

The areas needed to pass floodwaters through the community without causing increases in flood heights by more than the NFIP requirement or to a lesser amount if desired by the community are determined by engineering calculations. After the floodway boundaries are determined and officially designated by local ordinance, total filling or development of the flood fringe will not increase flood levels by more than the previously determined amount (usually 1 foot).

The computed floodway widths and elevations for Crow and Bengis Creeks and the tributary to Bengis Creek are shown in Tables 4-6 (see Appendix C).

FLOOD PLAIN MANAGEMENT

Existing Flood Plain Management

The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 encourage wise management of flood-prone areas through land use management practices. The State of Alabama, responding to the National Flood Insurance Act, authorized and granted powers, by Section 11 of the Code of Alabama 1975 as amended, to each county or local government in Alabama to prescribe criteria for land management, including control measures in flood-prone areas. The Alabama Department of Economic and Community Affairs and the regional planning commissions assist county and local governments in carrying out this authority by developing comprehensive land management programs in flood-prone areas. The City of Stevenson has participated in the NFIP since August 11, 1975 (Emergency Program Phase). Entrance into this program authorized the sale of flood insurance at reduced rates for both residential and non-residential structures and mobile homes and their contents throughout the City. The National Flood Insurance Act of 1968 requires local units of government to develop land use management practices for flood-prone areas based on competent evaluation of flood hazards. In entering the NFIP, the City agreed to adopt the codes and ordinances necessary to protect future development in the community from flood hazards.

Alternatives For Flood Plain Management

The current low level of flood damages will allow local officials to emphasize strengthening their flood plain management program primarily by proper development and use in the flood plain and regulating upland land use changes to avoid increasing future runoff rates. Technical flood hazard information is a valu-

able tool which the City of Stevenson can use to guide development and use of the flood-prone area, thereby minimizing future losses from flooding. This section is intended to outline a program by which the City can reduce the destruction and loss of property associated with a flood, while at the same time achieving wise use of the flood-prone areas. The Flood Hazard Area Photomaps contained in this report could be considered for adoption as part of Stevenson's flood plain management program, or the data could be transferred to the City's zoning map. If flood zone maps are developed and published as part of a NFIP flood insurance study, these maps could be officially incorporated into the City's flood plain management ordinance. Additional controls may need to be imposed when more detailed information is available. It is recommended that the City develop a program to publicize the availability of flood insurance and encourage community residents to participate in the program, especially those located in or near flood-prone areas. Residents in flood-prone areas should be made aware of the potential impacts of not obtaining flood insurance coverage.

In conformance with the requirements of the NFIP, the City is already enforcing certain regulations in currently identified flood-prone areas. These include the basic subdivision and zoning ordinances and construction codes. A local regulatory program should be implemented through the use of codes and ordinances and proper administrative procedures. Revision of existing codes and adoption of effective policies and procedures can result in the wise management of flood-prone areas in future years. Land use management practices in flood-prone areas are an important aspect of a flood plain management program. These practices include zoning, subdivision regulation, and construction standards. Additional regulations developed for the flood-prone areas should

be integrated with the City's existing land use management policies. The ordinances that are amended and the additional regulations that are adopted should be mutually supporting and should be compatible with the City's overall development policies. Assistance can be provided by the Top of Alabama Regional Council of Governments or ADECA in developing the regulatory measures needed. The following alternatives may also be viable as a part of the City's overall plan to minimize future flood damages.

Flood warning and forecasting: The National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) Office in Birmingham, Alabama, issues flood warnings for the Tennessee River. Severe weather and flood warnings, along with general weather forecasts, are distributed by the National Weather Wire Service. The National Weather Service is linked by teletype to the media (newspaper, radio, television) and any other private or government agency in the area where a primary wire service has been established, if they arrange in advance for the service. Other local media may obtain the information relayed through newswire services. Provisions for evacuation operations of county public service agencies are accomplished through the Jackson County Civil Defense Office. Stage readings and predictions of the National Weather Service are furnished to local and county Emergency Management Agencies (Civil Defense Units) when flooding is predicted in their area. Once a flash flood watch is issued by the National Weather Service, the County Emergency Management Agency Office monitors stream stages and issues hourly statements to local radio stations for broadcast to the public. Evacuation of low-lying areas is accomplished through the help of local National Guard Units and rescue squads.

Temporary Evacuation: This is sometimes the only practical method of reducing

flood damage at existing developments; but to be effective, reliable forecasts of stream stages must be available to provide time for action. Such forecasts are available for the Tennessee River and its major tributaries from the National Weather Service. Public safety and emergency management officials of Stevenson may wish to consider the development of a temporary evacuation plan.

Construction Standards: The City is currently enforcing the Southern Standard Building Codes published by the Southern Building Code Congress and the National Electrical Code published by the National Fire Protection Association. Standards should be considered for adoption for filling areas subject to flooding. Also, guidelines should be established for storage of materials in flood-prone areas. These standards and guidelines may be incorporated into a single flood-prone area ordinance that will supplement existing construction codes.

Flood Proofing: Flood proofing involves adjustments to structures and their contents to minimize damage due to flooding. Damageable equipment can be enclosed in waterproof coverings. Buildings may be waterproofed by closing openings in outer walls with impervious materials, installing check valves on sewer lines, installing temporary bulkheads over doors or windows, and other adjustments. Well-built commercial and industrial buildings are particularly adaptable to flood proofing. Information on flood proofing techniques is available from the ADECA.

Flood Damage Reduction Measures: The following alternative methods of potential flood damage reduction measures for Bengis Creek were evaluated: (1) increasing the flow area of the Highway 117 bridge crossing Bengis Creek mile

0.85, (2) channel improvement including changing stream alignment and channel size between Highway 117 mile 0.85 and mile 2.28, and (3) combination of increasing flow area of Highway 117 and channel improvements.

These flood damage reduction measures are not feasible due to the environmental impacts, project costs, and minimal reduction in levels of flooding accomplished.

Summary

To be effective, flood plain management measures should perform the following functions:

1. Reduce or prevent future flood damages and the loss of life.
2. Promote wise use of the flood plain.
3. Reserve for the passage of floodwaters that area of the flood plain where damages and destruction are inevitable during a flood event that equals or exceeds the 100-year flood (i.e., the floodway).
4. Increase the awareness of developers and users of the flood plain regarding the flood potential in the area.

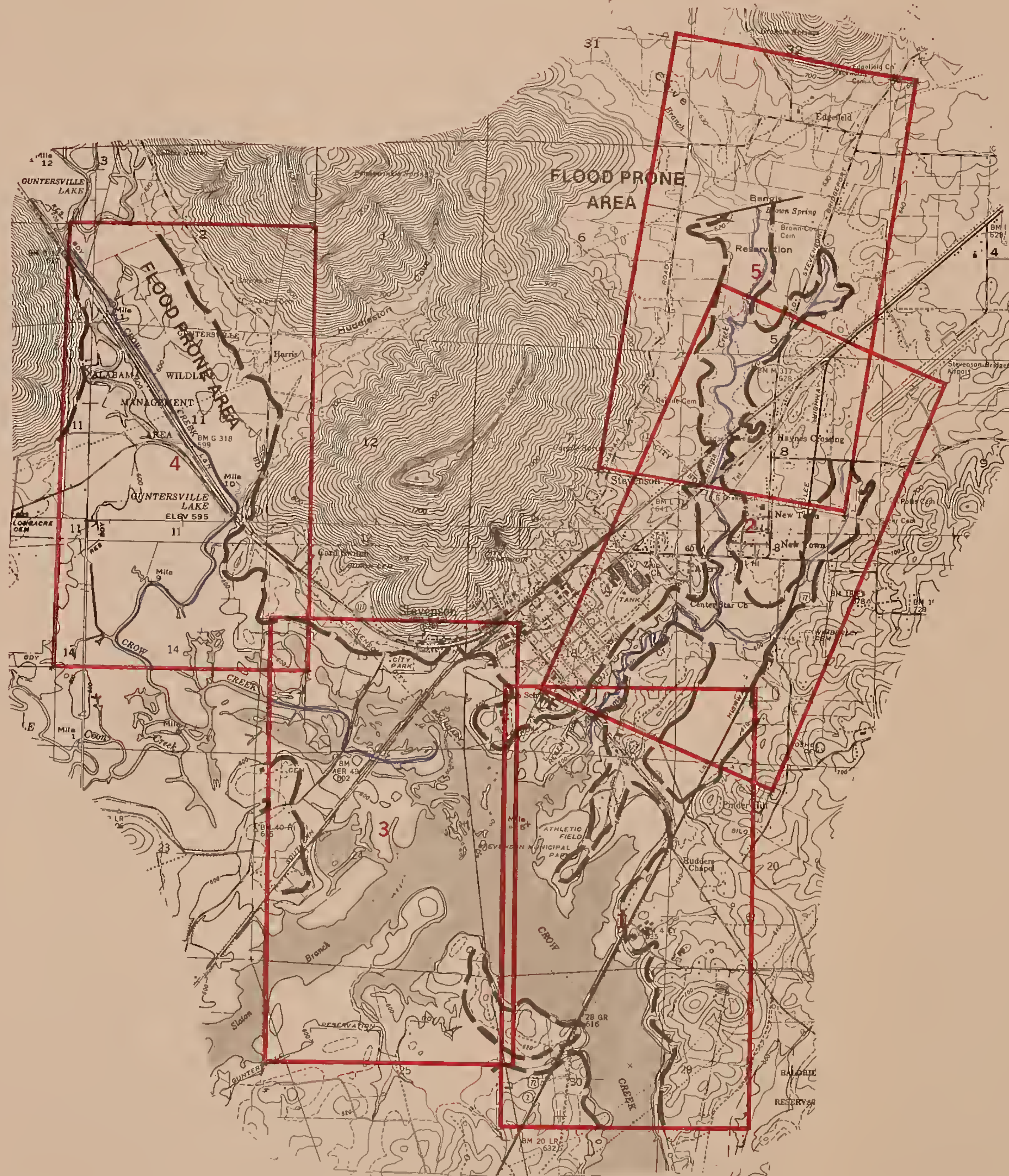
The success of the flood plain management program will depend greatly upon the efforts made by the local government to inform the public of the program. A public information program should be designed specifically to disseminate to all affected parties the essentials of the program, including code requirement, standards, and insurance provisions. The program affects not only future construction but also existing development. Thus, it is essential that this study by coordinated with the NFIP and that property owners, land developers, real estate interests, construction interests, and lending institutions be

acquainted with the Flood Plain Management Program and all of its implications. A knowledgeable and well-informed citizenry is the key to a successful Flood Plain Management Program.

APPENDIX A

LOCATION MAP AND PHOTOMAP INDEX

FLOOD HAZARD AREAS - SHEETS 1 THROUGH 5



0 — 5000 — 10000 Feet
1000 — 2000 Meters
APPROXIMATE

LEGEND

City Limits
Stream
Photomap Sheet Area Coverage
Flood Prone Area

ALABAMA

Original Base - U. S. G. S. Topographic Map

LOCATION MAP AND PHOTOMAP INDEX

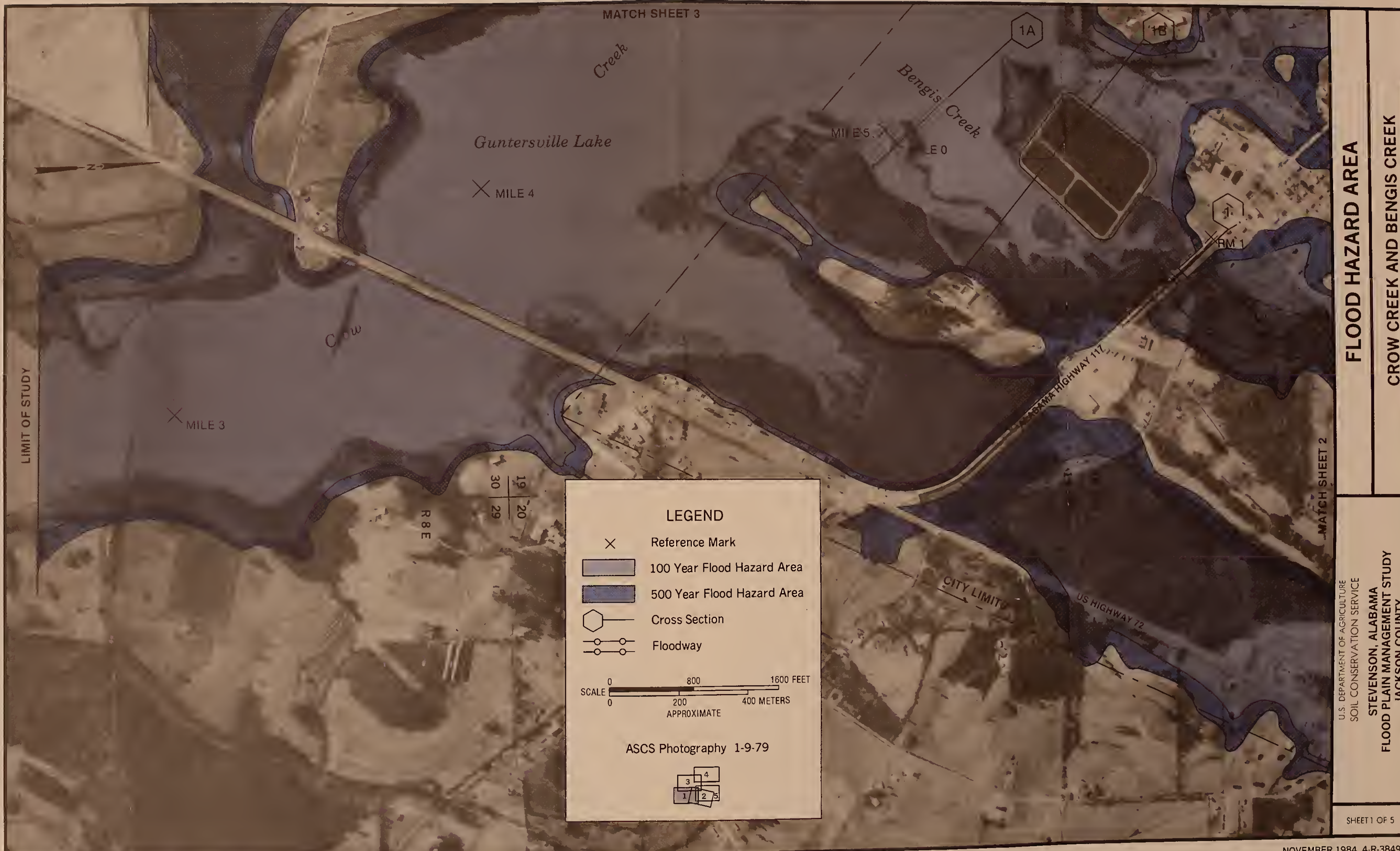
CROW CREEK
BENGIS CREEK AND TRIBUTARY

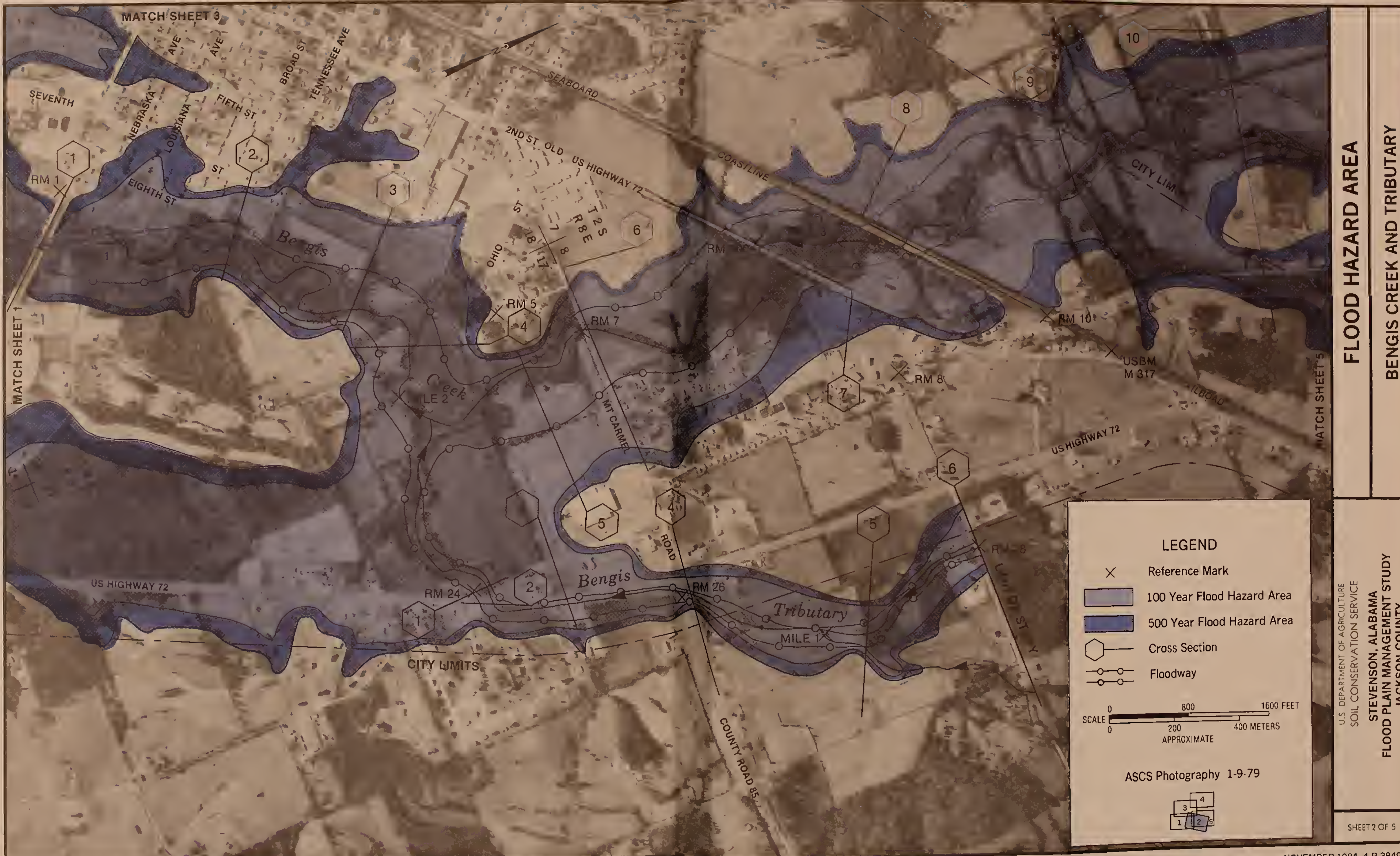
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
STEVENSON, ALABAMA
FLOOD PLAIN MANAGEMENT STUDY
JACKSON COUNTY

SHEET 1

USDA-SCS-FORT WORTH, TEXAS 1984

NOVEMBER 1984 4-R-38493


MATCH SHEET 3
Creek
Guntersville Lake
MILE 4
Bengis Creek
MILE 5
1A
1B
Crow
MILE 3
LIMIT OF STUDY
RM 1
ALABAMA HIGHWAY 117
30 19
29 20
R8E
CITY LIMITS
US HIGHWAY 72
MATCH SHEET 2
LEGEND
Reference Mark
100 Year Flood Hazard Area
500 Year Flood Hazard Area
Cross Section
Floodway
SCALE 0 800 1600 FEET
0 200 400 METERS
APPROXIMATE
ASCS Photography 1-9-79
FLOOD HAZARD AREA
CROW CREEK AND BENGIS CREEK
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
STEVENSON, ALABAMA
FLOOD PLAIN MANAGEMENT STUDY
JACKSON COUNTY
SHEET 1 OF 5
NOVEMBER 1984 4-R-38493



FLOOD HAZARD AREA
BENGIS CREEK AND TRIBUTARY
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
STEVENSON, ALABAMA
FLOOD PLAIN MANAGEMENT STUDY
JACKSON COUNTY
SHEET 2 OF 5
LEGEND
Reference Mark
100 Year Flood Hazard Area
500 Year Flood Hazard Area
Cross Section
Floodway
SCALE 0 800 1600 FEET
0 200 400 METERS
APPROXIMATE
ASCS Photography 1-9-79
MATCH SHEET 3
MATCH SHEET 1
MATCH SHEET 5
SEVENTH
NEBRASKA
LOUISIANA
AVE
BROAD ST
TENNESSEE AVE
FIFTH ST
EIGHTH ST
SEABOARD
COASTLINE
2ND ST OLD US HIGHWAY 72
OHIO ST
T 2 S
R 8 E
MT CARMEL ROAD
US HIGHWAY 72
CITY LIMITS
CITY LIM
COUNTY ROAD 85
USBM M 317
RM 1
RM 5
RM 7
RM 8
RM 10
RM 24
RM 26
MILE 1
MILE 2
Bengis
Creek
Bengis
Tributary

FLOOD HAZARD AREA

CROW CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
FLOOD PLAIN MANAGEMENT STUDY
JACKSON COUNTY

SHEET 3 OF 5

NOVEMBER 1984 4-R-38493

FLOOD HAZARD AREA

CROW CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
FLOOD PLAIN MANAGEMENT STUDY
JACKSON COUNTY

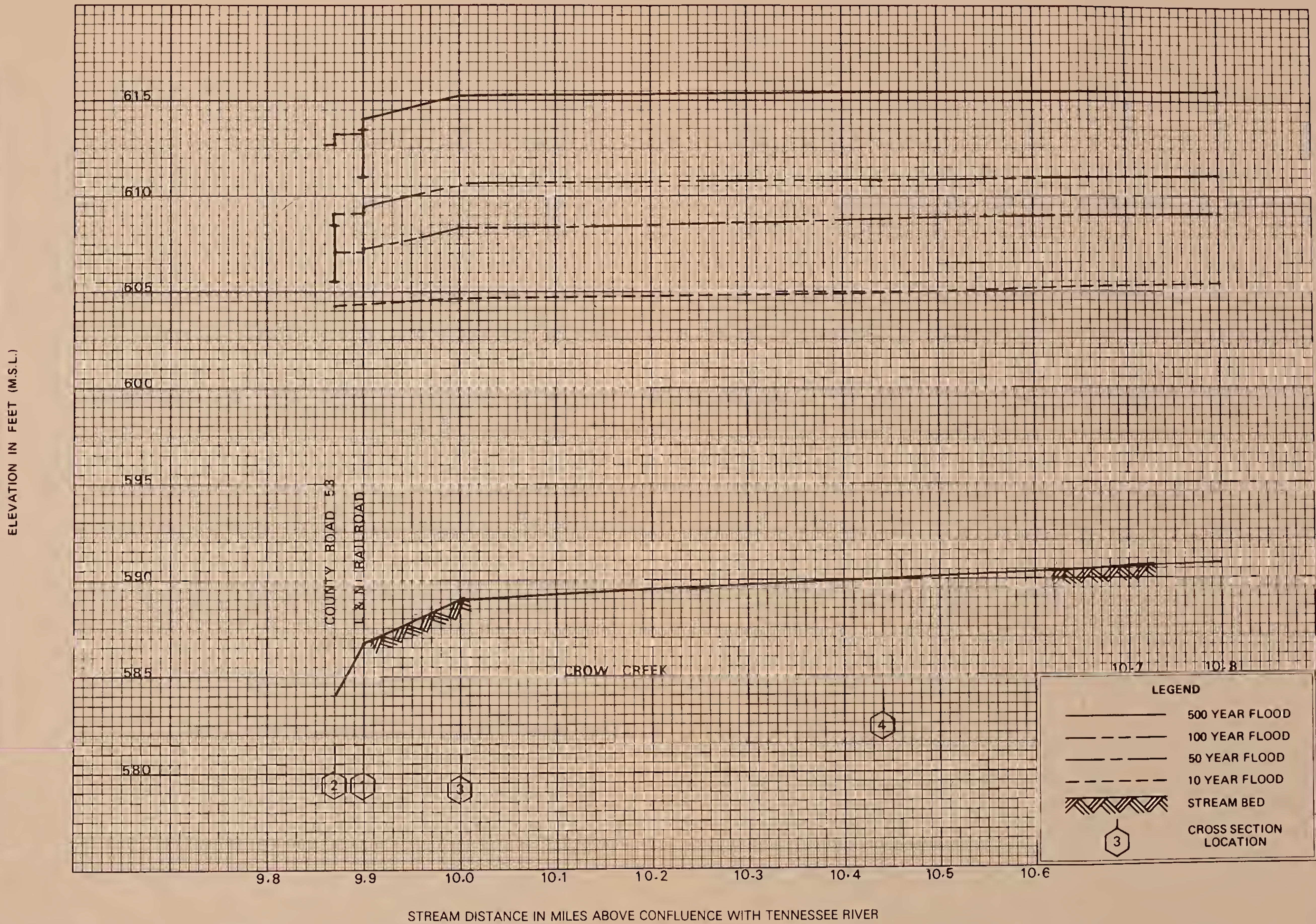
SHEET 4 OF 5

NOVEMBER 1984 4-R-38493

NOVEMBER 1984 4-R-38493

APPENDIX B

FLOOD PROFILES

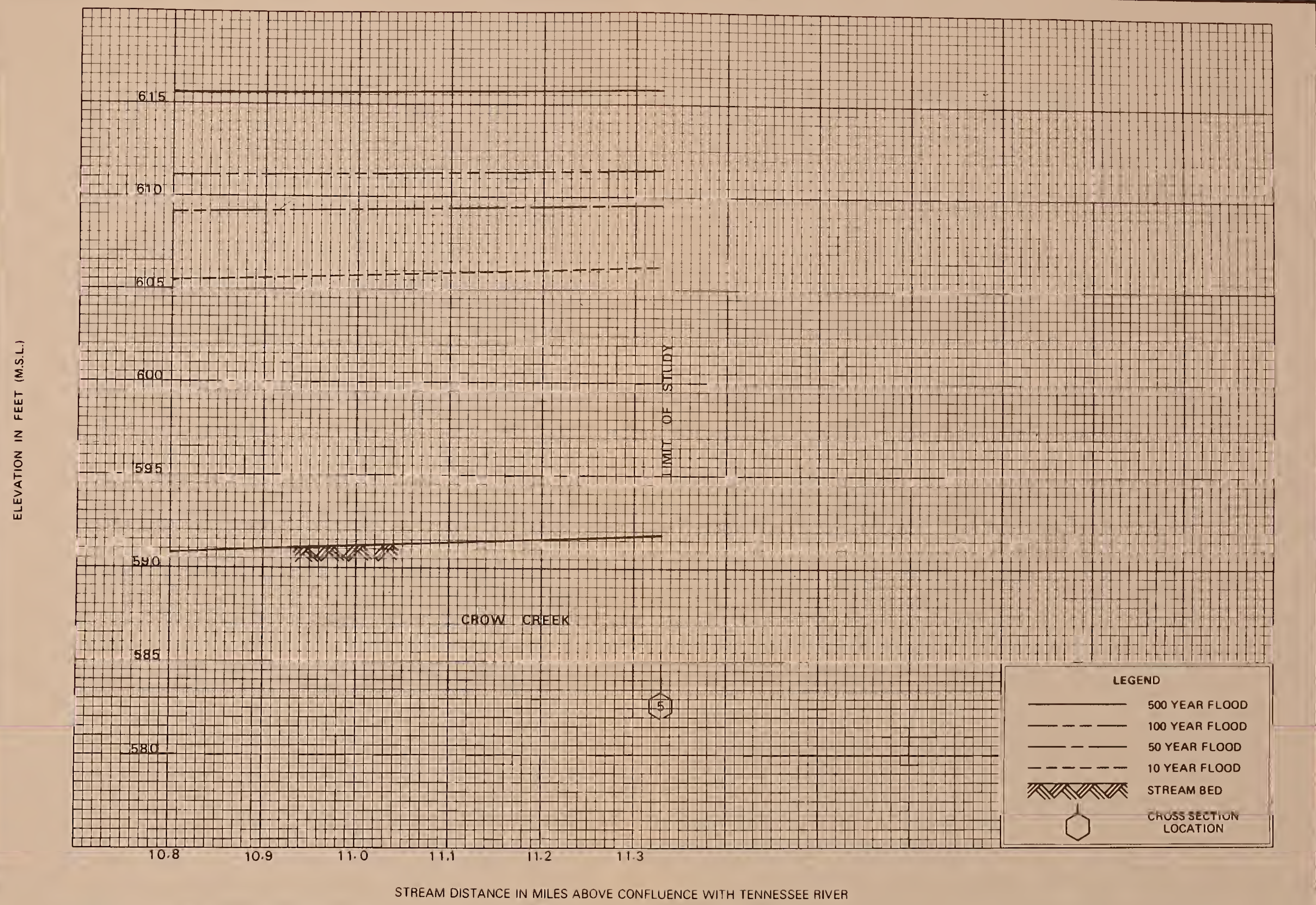


FLOOD PROFILES

CROW CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
(JACKSON COUNTY)

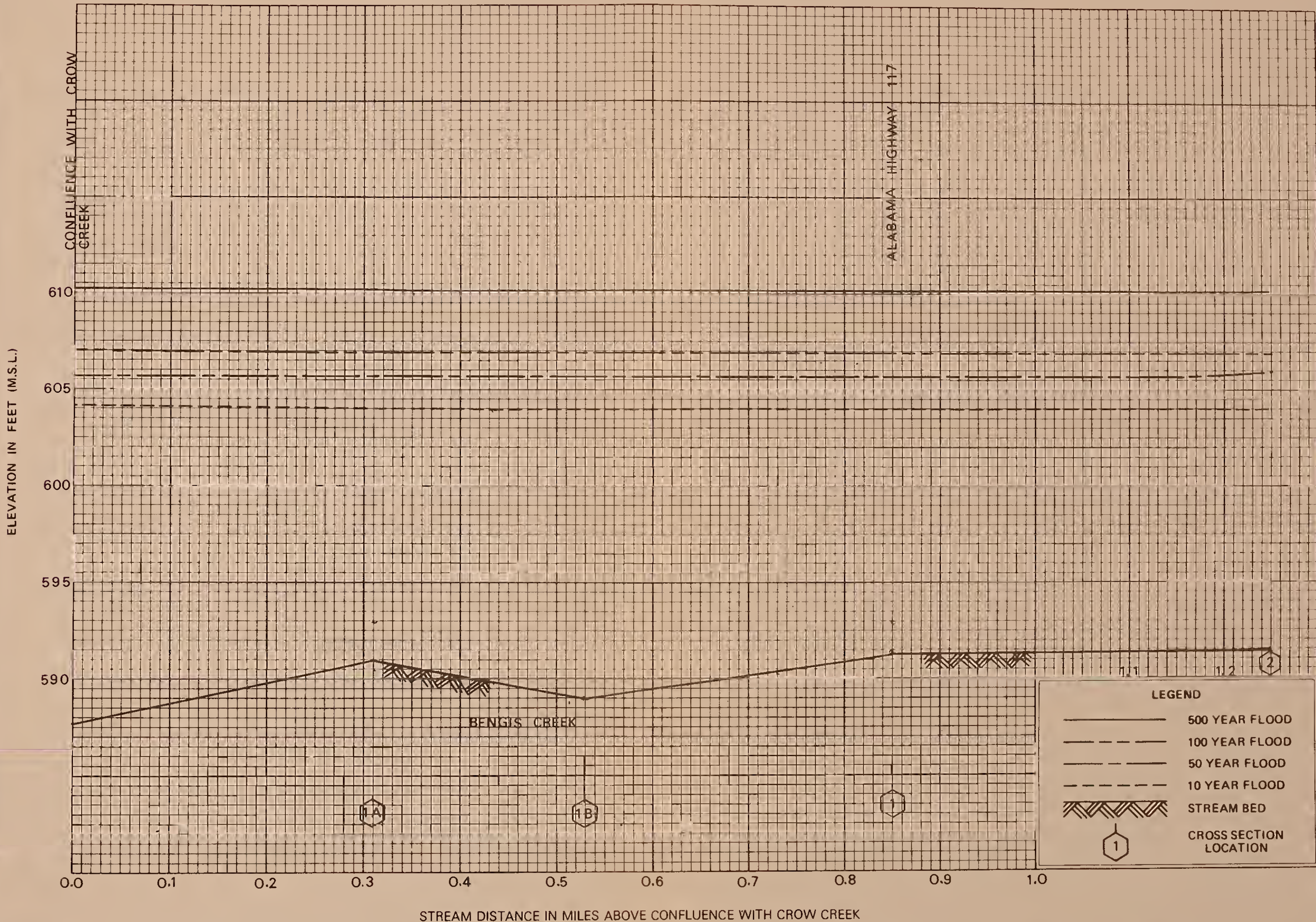


FLOOD PROFILES

CROW CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
(JACKSON COUNTY)



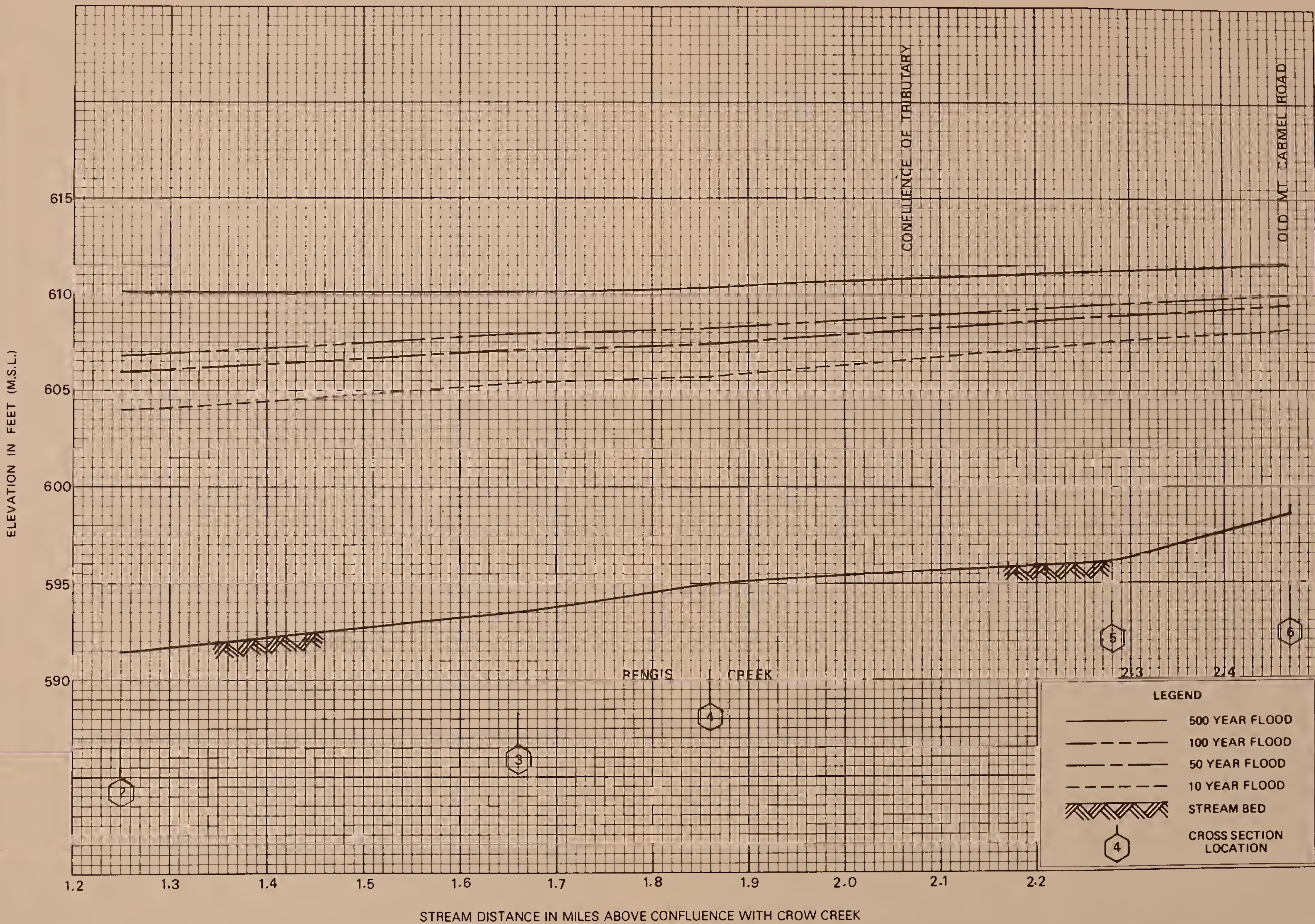
FLOOD PROFILES

BENGIS CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
(JACKSON COUNTY)

B-3

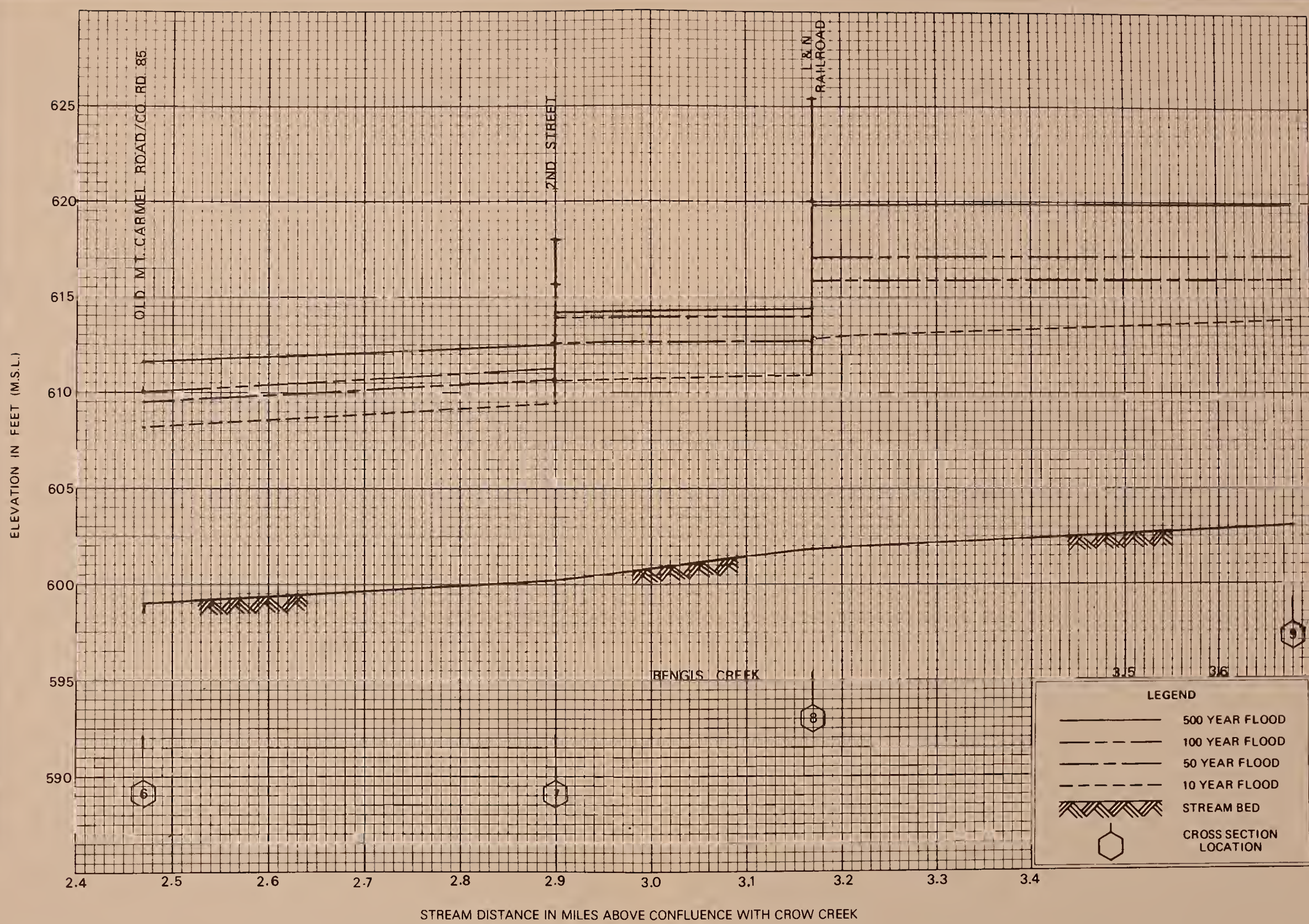


FLOOD PROFILES

BENGIS CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
(JACKSON COUNTY)

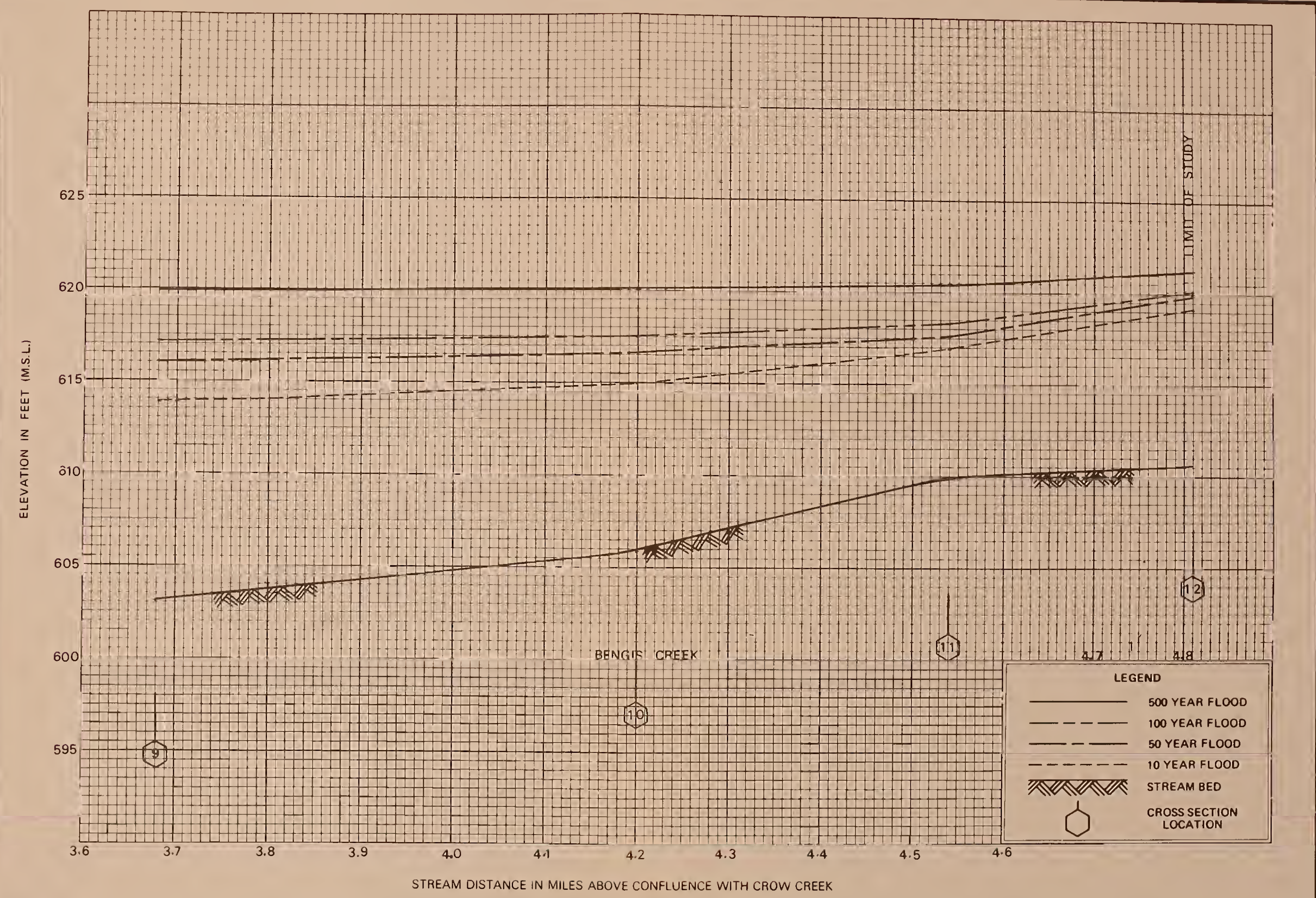


FLOOD PROFILES

BENGIS CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
(JACKSON COUNTY)

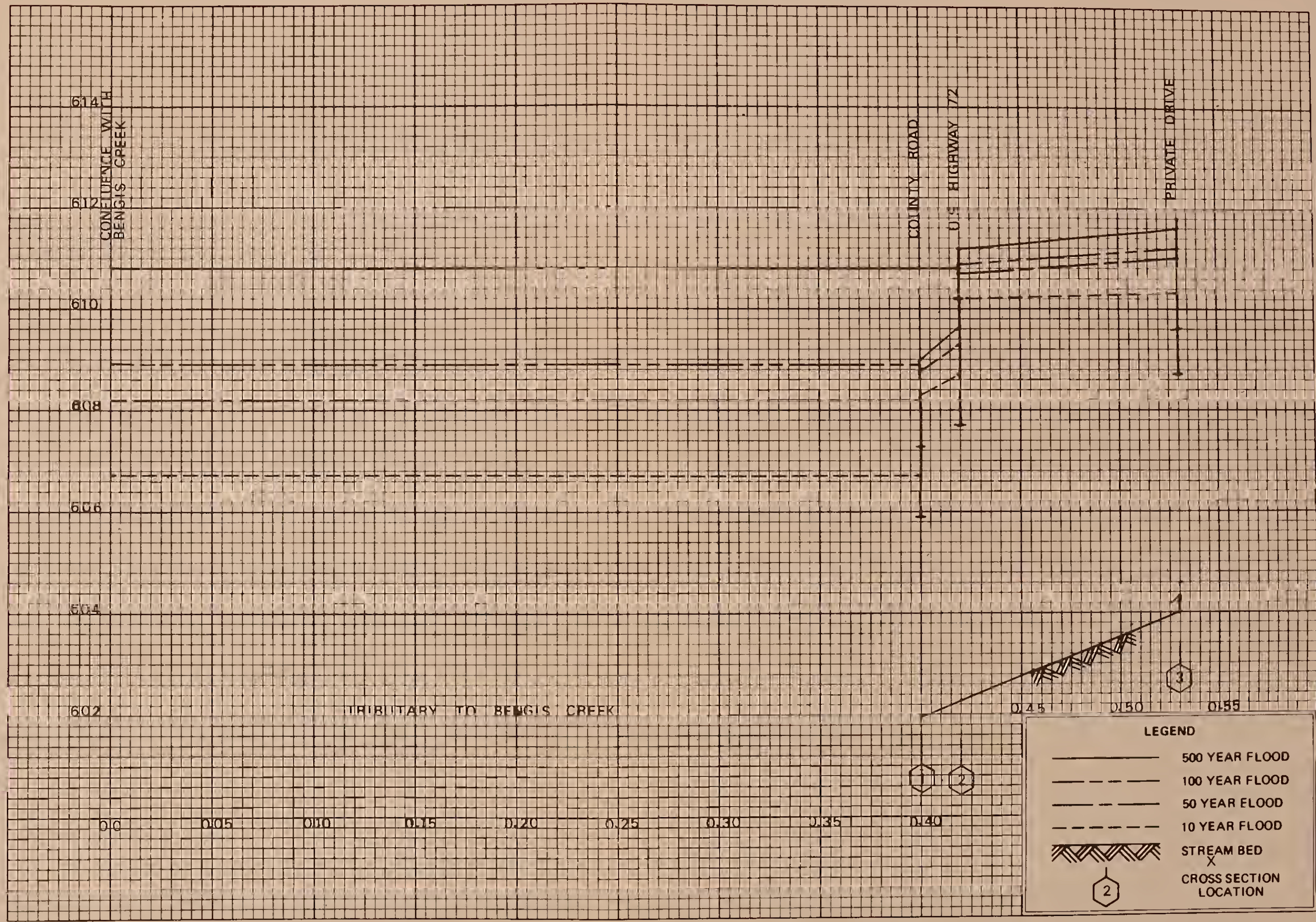


FLOOD PROFILES

BENGIS CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
(JACKSON COUNTY)



ELEVATION IN FEET (M.S.L.)

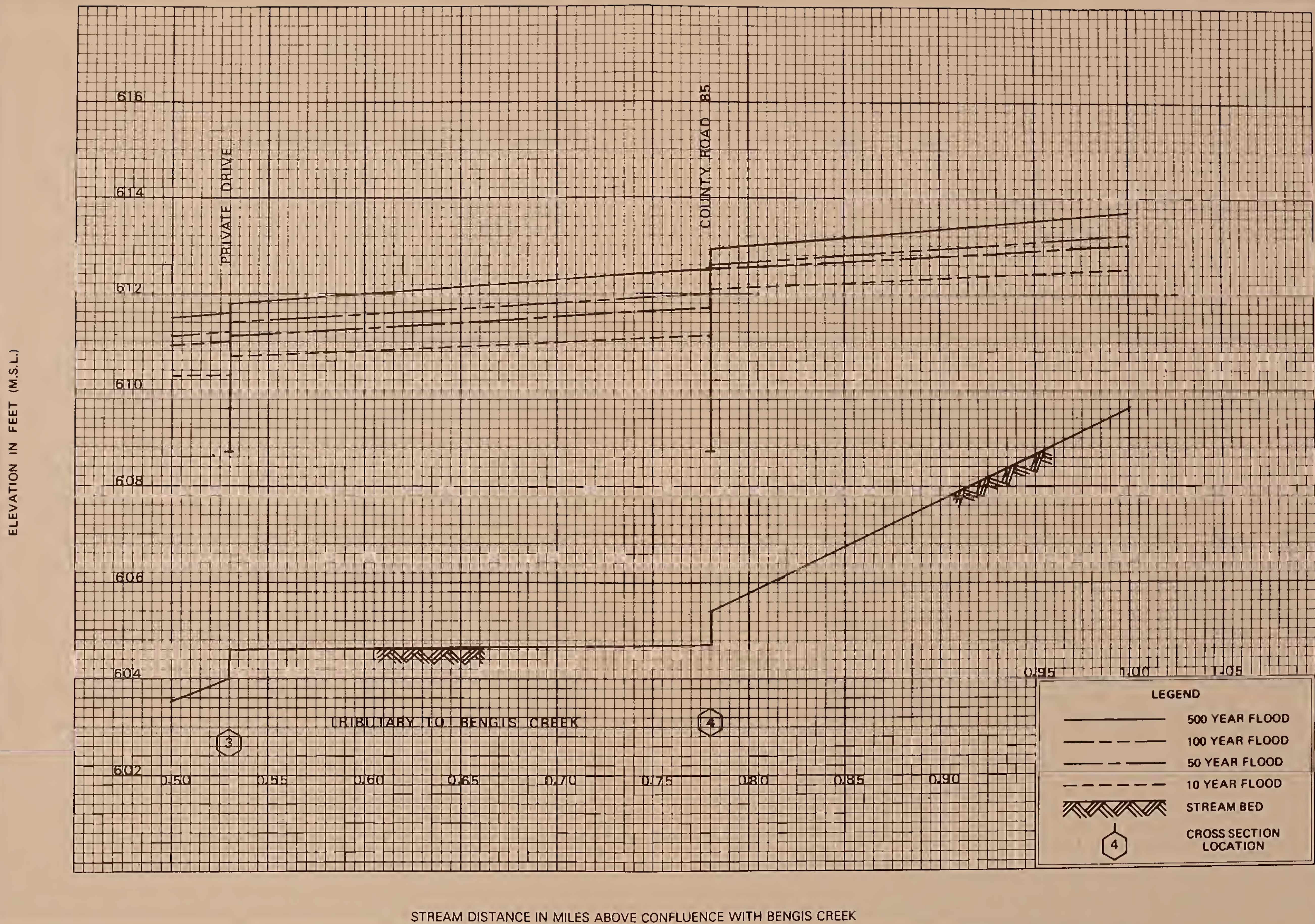
STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH BENGIS CREEK

FLOOD PROFILES

TRIBUTARY BENGIS CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
(JACKSON COUNTY)

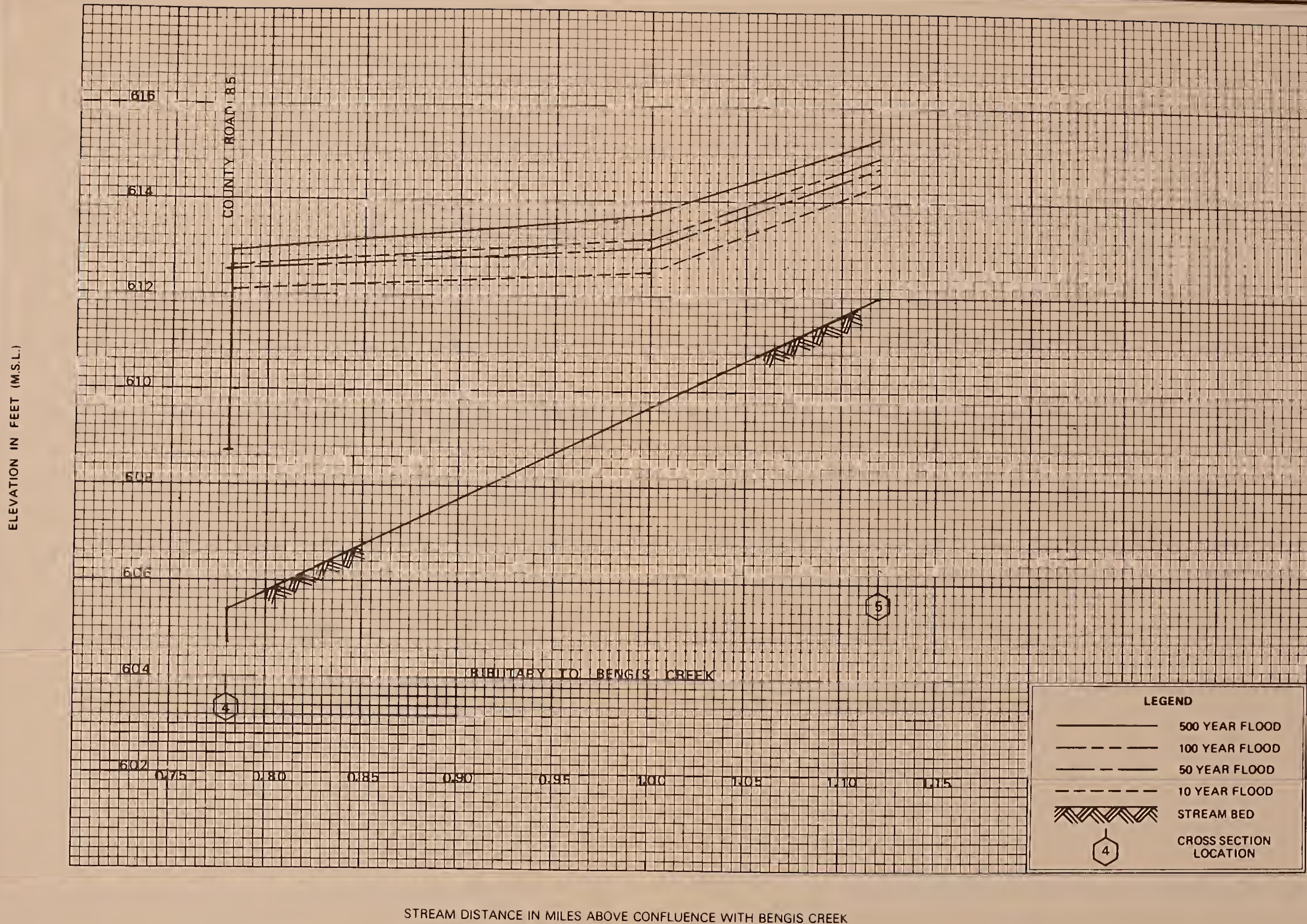


FLOOD PROFILES

TRIBUTARY BENGIS CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
(JACKSON COUNTY)



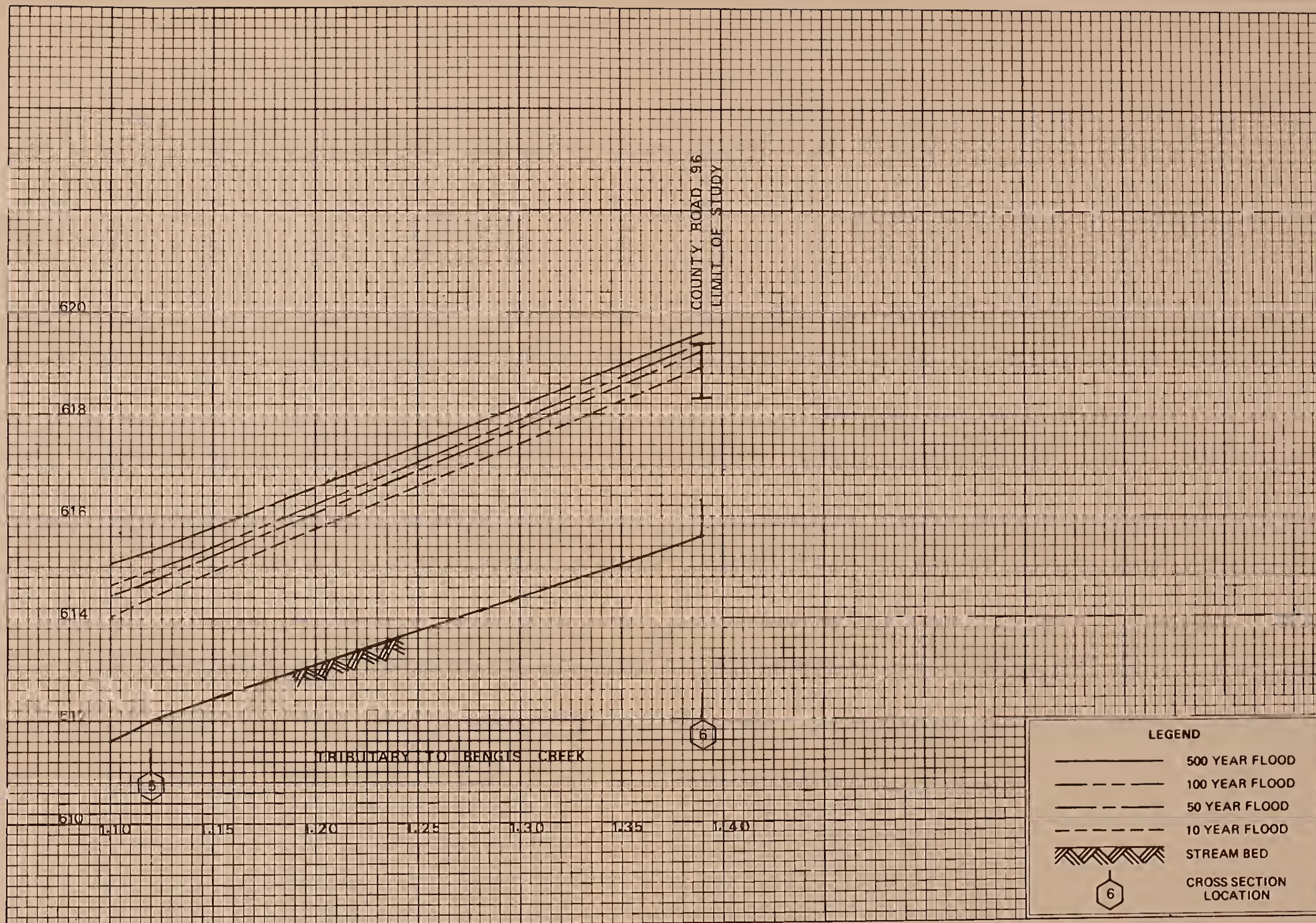
FLOOD PROFILES

TRIBUTARY BENGIS CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
(JACKSON COUNTY)

ELEVATION IN FEET (M.S.L.)



STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH BENGIS CREEK

FLOOD PROFILES

TRIBUTARY BENGIS CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STEVENSON, ALABAMA
(JACKSON COUNTY)

APPENDIX C

FLOODWAY TABLES

PROFILE TABULATIONS

Table 4

CROW CREEK 100-YEAR FLOODWAY[6/]

Cross Section		Floodway			Water Surface Elevation[b]		
No.	Mile	Width (feet)	Section Area (sq. ft)	Mean Velocity (ft/sec)	With Floodway	Without Floodway	Difference
1	9.87 DS[a]	162	3481	7.3	609.6	608.6	1.0
1	9.87 US[a]	162	3512	7.2	609.8	609.1	0.7
2	9.90 DS	150	3050	8.3	609.8	609.1	0.7
2	9.90 US	150	3085	8.2	610.0	609.3	0.7
3	10.00	1400	18954	1.3	611.4	610.6	0.8
4	10.42	1400	17939	1.4	611.7	610.8	0.9
5	11.33	1550	17992	1.4	612.4	611.4	1.0

a. Downstream and upstream at bridges.
b. Feet above mean sea level (USC&GS 1929 General Adjustment).

Table 5

BENGIS CREEK 100-YEAR FLOODWAY 6/

Cross Section		Floodway			Water Surface Elevation[b]		
No.	Mile	Width (feet)	Section Area (sq. ft)	Mean Velocity (ft/sec)	With Floodway	Without Floodway	Difference
1	0.85 DS[a]	390	2894	2.0	603.6[c]	603.2[c]	0.4
1	0.85 US[a]	390	3838	1.5	605.9[c]	605.8[c]	0.1
2	1.25	350	3008	1.9	607.5	606.9	0.6
3	1.66	510	4343	1.3	608.7	607.9	0.8
4	1.86	560	4230	1.3	609.1	608.2	0.9
5	2.28	600	3506	1.4	610.5	609.5	1.0
6	2.47 DS	700	4729	1.0	610.9	610.0	0.9
6	2.47 US	700	4807	1.0	611.0	610.0	1.0
7	2.90 DS	850	4690	1.0	612.1	611.2	0.9
7	2.90 US	850	7529	0.6	613.9	613.9	0.0
8	3.17 DS	600	3957	1.2	614.0	614.0	0.0
8	3.17 US	600	4500	1.0	617.0	617.0	0.0
9	3.68	550	4082	1.1	617.4	617.2	0.2
10	4.20	550	3204	1.3	618.1	617.5	0.6
11	4.54	370	1719	2.3	619.1	618.3	0.8
12	4.81	360	1714	2.3	620.9	620.1	0.8

a. Downstream and upstream at bridges.
b. Feet above mean sea level (USC&GS 1929 General Adjustment).
c. Elevations computed without consideration of backwater effects from Guntersville Lake. Table 8 and Appendix B profiles reflect the backwater effect of Guntersville Lake.

Table 6

TRIBUTARY TO BENGIS CREEK 100-YEAR FLOODWAY[6/]

Cross Section		Floodway			Water Surface Elevation[b]		
No.	Mile	Width (feet)	Section Area (sq. ft.)	Mean Velocity (ft/sec)	With Floodway	Without Floodway	Difference
1	0.40 DS[a]	130	630	1.9	607.5[c]	606.5[c]	1.0
1	0.40 US[a]	130	642	1.8	609.7	609.0	0.7
2	0.42 DS	110	711	1.6	610.4	609.6	0.8
2	0.42 US	110	628	1.8	611.7	610.9	0.8
3	0.53 DS	100	495	2.3	612.0	611.2	0.8
3	0.53 US	100	486	2.3	612.3	611.4	0.9
4	0.78 DS	110	537	1.9	613.0	612.0	1.0
4	0.78 US	70	352	2.9	613.5	612.6	0.9
5	1.12	180	443	2.1	615.4	614.9	0.5
6	1.39 DS	60	191	2.1	620.1	619.4	0.7
6	1.39 US	60	242	1.7	621.0	620.1	0.9

a. Downstream and upstream at bridges.
b. Feet above mean sea level (USC&GS 1929 General Adjustment).
c. Elevations computed without consideration of backwater effects from Bengis Creek. Table 9 and Appendix B profiles reflect the backwater effect of Bengis Creek.

Table 7

CROW CREEK PROFILE TABULATION 6/

Cross Section No.	Cross Section Mile	10-Year Flood Discharge (CFS)[b]	10-Year Flood Elevation[c] (Feet)	50-Year Flood Discharge (CFS)[b]	50-Year Flood Elevation[c] (Feet)	100-Year Flood Discharge (CFS)[b]	100-Year Flood Elevation[c] (Feet)	500-Year Flood Discharge (CFS)[b]	500-Year Flood Elevation (Feet)
*	0.00		603.8[d]		604.7[d]		605.2[d]		607.7[d]
1	9.87 DS[a]		604.2[e]	21540	606.8	25260	608.6	34780	612.7
1	9.87 US[a]		604.2[e]	21540	607.1	25260	609.1	34780	613.3
2	9.90 DS		604.2[e]	21500	607.1	25200	609.1	34700	613.3
2	9.90 US		604.3[e]	21500	607.3	25200	609.3	34700	613.9
3	10.00		604.6[e]	21480	608.4	25175	610.6	34670	615.3
4	10.42		604.9[e]	21405	608.7	25075	610.8	34545	615.4
5	11.33	13510	606.1	21215	609.5	24800	611.4	34200	615.8
*	11.87	13510	606.9	21215	610.0	24800	611.7	34100	616.0

*Sections not shown on flooded area maps or profiles.

a. Downstream and upstream at bridges.
b. Cubic feet per second (cfs) is a measurement of the volume of water flowing past a given point per second.
c. Feet above mean sea level (USC&GS 1929 General Adjustment).
d. Elevations at Tennessee River mile 401.2.
e. Elevation reflecting combined effect of Crow Creek and Tennessee River flooding.

Table 8

BENGIS CREEK PROFILE TABULATION[6/]

Cross Section No.	Cross Section Mile	10-Year Flood Discharge (CFS)[b]	10-Year Flood Elevation[c] (Feet)	50-Year Flood Discharge (CFS)[b]	50-Year Flood Elevation[c] (Feet)	100-Year Flood Discharge (CFS)[b]	100-Year Flood Elevation[c] (Feet)	500-Year Flood Discharge (CFS)[b]	500-Year Flood Elevation[c] (Feet)
*	0.00		604.0[d]		605.7[d]		606.9[d]		610.2[d]
1	0.85 DS[a]		604.0[d]		605.7[d]		606.9[d]		610.2[d]
1	0.85 US[a]		604.0[d]		605.7[d]		606.9[d]		610.2[d]
*	1.18				605.7[d]				
2	1.25		604.0[d]	4900	605.9	5735	606.9		610.2[d]
*	1.28		604.0[d]						
3	1.66	3130	605.3	4850	607.1	5665	607.9		610.2[d]
*	1.76								610.2[d]
4	1.86	3115	605.7	4820	607.4	5630	608.2	7735	610.3
5	2.28	2675	607.6	4165	608.9	4860	609.5	6690	611.3
6	2.47 DS	2650	608.2	4130	609.4	4815	610.0	6630	611.6
6	2.47 US	2650	608.2	4130	609.5	4815	610.0	6630	611.6
7	2.90 DS	2590	609.5	4050	610.7	4710	611.2	6490	612.5
7	2.90 US	2590	610.7	4050	612.6	4710	613.9	6490	614.2
8	3.17 DS	2550	610.9	4000	612.7	4650	614.0	6400	614.4
8	3.17 US	2550	612.9	4000	615.8	4650	617.0	6400	619.8
9	3.68	2500	613.8	3900	616.0	4550	617.2	6255	619.9
10	4.20	2320	614.9	3630	616.6	4235	617.5	5825	620.1
11	4.54	2195	616.8	3440	617.6	4015	618.3	5525	620.4
12	4.81	2110	619.1	3310	619.8	3865	620.1	5315	621.2

*Sections not shown on flooded area maps or profiles.

a. Downstream and upstream at bridges.
b. Cubic feet per second (cfs) is a measurement of the volume of water flowing past a given point per second.
c. Feet above mean sea level (USC&GS 1929 General Adjustment).
d. Elevations at Crow Creek, mile 5.0.

Table 9

TRIBUTARY TO BENGIS CREEK PROFILE TABULATION 6/

Cross Section		10-Year Flood		50-Year Flood		100-Year Flood		500-Year Flood	
No.	Mile	Discharge (CFS)[b]	Elevation[c] (Feet)	Discharge (CFS)[b]	Elevation[e] (Feet)	Discharge (CFS)	Elevation[c] (Feet)	Discharge (CFS)	Elevation[c] (Feet)
*	0.00		606.7[d]		608.2[d]		608.9[d]		610.8[d]
1	0.40 DS[a]	635	606.7[d]	970	608.2[d]	1165	608.9[d]	1560	610.8[d]
1	0.40 US[a]	635	608.3	970	608.8	1165	609.0	1560	610.8[d]
2	0.42 DS	630	608.7	965	609.3	1160	609.6	1550	610.8[d]
2	0.42 US	630	610.2	965	610.7	1160	610.9	1550	611.2
3	0.53 DS	615	610.3	935	611.0	1120	611.2	1500	611.6
3	0.53 US	615	610.7	935	611.1	1120	611.4	1500	611.8
4	0.78 DS	580	611.1	860	611.7	1030	612.0	1395	612.5
4	0.78 US	580	612.1	860	612.5	1030	612.6	1395	612.9
*	0.90	550	612.3	800	612.8	950	613.0	1300	613.4
*	1.00	550	612.5	800	613.0	950	613.2	1300	613.7
5	1.12	550	614.4	800	614.7	950	614.9	1300	615.3
6	1.39 DS	250	618.9	350	619.2	400	619.4	550	619.6
6	1.39 US	250	619.0	350	620.0	400	620.1	550	620.2

*Sections not shown on flooded area maps or profiles.

a. Downstream and upstream at bridges.
b. Cubic feet per second (cfs) is a measurement of the volume of water flowing past a given point per second.
c. Feet above mean sea level (USC&GS 1929 General Adjustment).
d. Elevations at Bengis Creek, mile 2.07.

APPENDIX D

INVESTIGATION AND ANALYSIS

ELEVATION REFERENCE MARKS

GLOSSARY OF TERMS

BIBLIOGRAPHY

INVESTIGATION AND ANALYSIS

Reaches of Study

The streams and reaches studied are: Crow Creek from mile 9.97 to approximately 2.0 miles above the L&N Railroad at mile 11.87; Bengis Creek from its mouth on Crow Creek to 1.5 miles above the L&N Railroad at mile 4.81; and tributary to Bengis Creek from its mouth on Bengis Creek to mile 1.39. The reach of Crow Creek from the mouth at Tennessee River mile 401.2 to mile 9.97 was approximated using Tennessee River elevations at the mouth and Crow Creek elevations at mile 9.97; therefore, profile sheets are not provided for this segment. Stream miles are measured from the mouth upstream, along the centerline of the stream.

Surveys

Field surveys completed in 1982 included 20 stream channel and valley cross sections, and 6 bridge and 6 road profile sections within the study area on Bengis Creek. Valley and channel cross sections were surveyed at selected locations to determine valley shape, width, and other hydraulic characteristics. Elevations of roads, bridges, culverts, and other control points were established. High water marks were surveyed for the 1973 historical flood. All of the surveys were referenced to mean sea level datum. The U. S. Geological Survey 7½-15-minute topographic quadrangle sheets (10-foot contour) were used for orientation.

Hydrology

Computed flood discharges on Crow Creek, Bengis Creek and its unnamed tributary are based on the analysis of stream gage records from similar watersheds in the region. Discharge estimates based on records from the Crow Creek stream gage

as well as the highwater mark on Bengis Creek supported the use of the regional relationships; however, the stream gage records were not directly used to determine flood-frequency on Crow Creek because of the relatively short period of record and the small number of discharge measurements used to define the gage rating. All stream gage analyses follow standard procedures outlined in "Guidelines for Determining Flood Flow Frequency 7/.

Channel improvement work was completed in 1968 on a portion of Crow Creek. This work consisted of channel straightening and clearing from mile 10.0 to mile 24.0 to accommodate an annual flood. Thus, the improvement work has a negligible effect on the area inundated by the 100-year flood.

Hydraulics

The hydraulic characteristics of Crow and Bengis Creeks, and the unnamed tributary of Bengis Creek were analyzed using the U.S. Army Corps of Engineers HEC-2N backwater program to provide estimates of the 10-, 50-, 100-, and 500-year flood elevations at selected cross sections. 8/ Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Hazard Area Photomaps and Flood Profiles.

The computed elevations at the cross sections were plotted on a graph at the stream mile locations of the cross sections and joined with straight lines to create the flood profiles (Appendix B, sheets B-1 through B-10). The elevations are shown in feet above mean sea level and the stream miles are measured from the mouth upstream. Tabulations of the 10-, 50-, 100-, and 500-year flood profiles and discharges for the studied streams are included on Tables 7-9, Appendix C.

The computed flood elevations are based on the assumption that bridges and other hydraulic structures remain open and unobstructed. The accumulation of debris under bridges during the time of flooding may raise the flood elevations higher than those shown on the stream profile. The Flood Hazard Area Photomaps (Appendix A, sheets 1-5) show the areas that would be inundated by the 100- and 500-year floods. Using the flood profiles and recent topographic maps, the flood elevations were transferred from the profiles to the corresponding locations on the map to establish the expected limits of flooding on the ground.

Natural and Cultural Values

The discussion of natural and cultural values is based on accumulated data published in various sources and personal observations of the staff biologist.

ELEVATION REFERENCE MARKS

(See Flood Hazard Areas)

TABLE 10
ELEVATION REFERENCE MARKS [1/]

REFERENCE MARK	ELEVATION IN FEET (MSL)*	DESCRIPTION OF LOCATION
USC&GS E-12	627.433	About 1½ blocks SW along the main street from the main corner in town of Stevenson, across railroad tracks and the main street from the railroad station, 20 feet SW of projected plane of SW wall of the station building, 18 feet NE of vertex of estimated 10-degree angle in alinement of building fronts, in the limestone wall of old "Tennessee Valley Bank" which is incised in the stone above the door and now occupied by surgeon Dr. E. A. Browder, 0.6 foot SW of joint between limestone and brick walls, 3.2 feet above the sidewalk, set in a drill hole in the wall.
M-317	628.476	About 1.9 miles NE along Louisville and Nashville Railroad from the station in Stevenson, about 250 yards NE of the crossing of a N-S road, 0.2 mile SW along railroad and a county asphalt road from point of divergence of the two and No. 72 U.S. Hwy., at the divergence point of railroad and county road, 94 feet WNW of center line of 20-foot asphalt pavement, 59½ feet NE of center of No. 114/19 creosoted telephone pole, 30 feet SE of SE rail of main line double tracks, 1.0 feet lower than top of same, 1.9 feet WNW of steel witness post, and projecting 0.1 foot above ground.
D-12	609.284	About 0.45 mile WNW'ly along Louisville and Nashville Railroad and the main E-W street from the main crossing in town or 0.3 mile along same from the railroad station, about 60 yards ESE of the W end of a sidetrack, 29 feet N of N rail of main line, about 12 feet lower than top of same, 1.0 foot E of W end of N headwall of 4-foot concrete box culvert under the railroad and 0.8 foot S of N face of the headwall.

TABLE NO. 10 (CONTINUED)

REFERENCE MARK	ELEVATION IN FEET (MSL)*	DESCRIPTION OF LOCATION
F-318	616.049	About 1.4 miles NW along Louisville and Nashville Railroad and No. 117 Alabama Hwy. from the station at Stevenson, at the junction of Nos. 54 and 117 Alabama Hwys., 130 feet SSW of center of crossing of railroad and No. 54 Hwy., 116 feet SW of SW rail, about 2 feet lower than top of same, 25 feet E of E corner of the main body of frame house, 55 feet SE of 3-foot hackberry tree, in estimated 10 square feet of outcrop rock of irregular shape.
AER-49	602.00	Located 1 mile southwest of Stevenson, in Sec. 24, T2S, R7E, on county road Stevenson to Fackler, at Big Crow Creek, in concrete curb of south abutment on bridge over Big Crow Creek. A standard TVA survey marker stamped "AER 49".
RM 1	616.03	On top of fire plug on southwest side of Kentucky Ave. and 150 feet southwest of intersection of eighth street and southwest of Jr. Food Store in Stevenson, Alabama.
RM 5	615.41	Nail in side of power pole at the intersection of Ohio and Avery Avenue in Stevenson, Alabama.
RM 7	607.27	A chisled square on top of the southeast corner of curb wall at the southeast end of bridge over Bengis Creek on Old Mt. Carmel Road.
RM 8	620.49	On top of fire plug on the west side of County Road 75 and at the intersection of Old Steam Plant Road in Stevenson, Alabama.
RM10	625.60	On top of the northeast bolt in concrete base for old railroad signal, 2.5' x 3.4' and on west side of County Road 75, and 7.5' ft. south of south rail of the south railroad track.

TABLE NO. 10 (CONTINUED)

REFERENCE MARK	ELEVATION IN FEET (MSL)*	DESCRIPTION OF LOCATION
RM 24	606.94	Nail in crotch of large forked oak tree on the west side of street that runs behind Stevenson Plaza Shopping Center and 150 ft. west of U.S. Hwy. 72 in Stevenson, Alabama.
RM 26	610.47	A chiseled square on top of the south headwall of the culvert under County Road 85 and on east end of culvert, and east of U.S. Hwy. 72.
RM 28	618.58	A chiseled square on the north end of a 24" concrete pipe under County Road 96 and at first drain east of U.S. Hwy. 72 in Stevenson, Alabama.
RM 100	619.54	A chiseled square on top of the northwest corner of the curb wall at the northwest corner of bridge over Bengis Creek on old U.S. Hwy. 72 in Stevenson, Alabama. Now marked as 2nd Street.

* Mean Sea Level (MSL).

1/ Locations designated on Flood Hazard Area Photomaps (Appendix A, Sheets 1 through 5).

GLOSSARY OF TERMS

Bridge Area -- The effective hydraulic flow area of a bridge opening accounting for the presence of piers, attached conduits, and skew (alignment), if applicable.

Channel -- A natural or artificial water course of perceptible extent with definite bed and banks to confine and conduct flowing water continuously or periodically.

Flood -- "Flood" or "flooding" means a general and temporary condition of partial or complete inundation of normally dry land areas from:

(1) The overflow of inland or tidal waters

(2) The unusual and rapid accumulation of runoff of surface water from any source.

Flood Frequency -- A means of expressing the probability of flood occurrences as determined from a statistical analysis of representative streamflow or rainfall and runoff records. It is customary to estimate the frequency with which specific flood stages or discharges may be equalled or exceeded, rather than the frequency of an exact stage or discharge. Such estimates by strict definition are designated "exceedence frequence," but in practice the term "frequency" is used. The frequency of a particular stage of discharge is usually expressed as occurring once in a specified number of years. Also see definition of "recurrence interval." For example --

Ten-Year Flood - The 10-year flood is defined as the flood which has 1 chance in 10 (10 percent) of being equaled or exceeded in any given

year. In a normal 30-year mortgage period, there is a 96 percent chance of its occurrence. The 10-year flood based on current watershed and channel conditions would generally range about 3 to 4 feet above the approximate banktop along Crow Creek and about 2 feet below the March 1973 flood on Bengis Creek.

Fifty-year Flood: The 50-year flood is defined as the flood which has 1 chance in 50 (2 percent) of being equaled or exceeded in any given year. In a normal 30-year mortgage period, there is a 45 percent chance of its occurrence. The 50-year flood would generally range from about 6 to 8 feet above the approximate banktop along Crow Creek and about equal to the March 1973 flood on Bengis Creek.

One Hundred-Year Flood: The 100-year flood is defined as the flood which has 1 chance in 100 (1 percent) of being equaled or exceeded in any given year. In a normal 30-year mortgage period, there is a 26 percent chance of its occurrence. The 100-year flood based on current watershed and channel conditions would generally range from about 8 to 10 feet above the approximate banktop along Crow Creek and from 1 to 2 feet above the March 1973 flood on Bengis Creek. The 100-year flood is the minimum standard required by the Federal Emergency Management Agency (FEMA) for flood plain management purposes for those communities participating in the NFIP.

Five Hundred-Year Flood: Although the 500-year flood may occur at any time, it is a rare event with 1 chance in 500 (0.2 percent) of being equaled or exceeded in any given year. In a 30-year period, there is about a 6 percent chance of its occurrence. The 500-year

flood based on current watershed and channel conditions would generally range from 13 to 15 feet above the approximate banktop along Crow Creek and about 2 feet above the March 1973 flood on Bengis Creek. The 500-year flood is provided as a guide for planning community and industrial development in those instances where a greater degree of protection from flooding must be provided.

Flood frequency and size are based on statistical analysis of streamflow records available for the watershed and analysis of rainfall and runoff characteristics in the general region of the watershed.

Flood Hazard Area -- Synonymous with Flood Plain (general). Used in FEMA National Flood Insurance Program. Commonly used in reference to flood map.

Flood Peak -- The highest stage or discharge attained during a flood event; also referred to as peak stage or peak discharge.

Flood Plain (general) -- The relatively flat area or low lands adjoining the channel of a river, stream, or watercourse; ocean, lake, or other body of standing water which has been or may be covered by floodwater.

Floodway Fringe -- The portion of the flood plain beyond the limits of the floodway. Flood waters in this area are usually shallow and slow moving.

Flood Plain (specific) -- A definitive area within a flood plain (general) or flood-prone area known to have been inundated by a historical flood,

or determined to be inundated by floodwater from a potential flood of a specified frequency.

Flood-Prone Area -- Synonymous with Flood Plain (general). Used in Alabama land management and use law.

Flood Profile -- A graph showing the relationship of water surface elevation to stream channel location. It is generally drawn to show the water surface elevation for the peak of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage -- The elevation of the overflow above the natural banks of a stream or body of water. Sometimes referred to as the elevation and the flood peak elevation measures for a specific storage area.

Floodway -- The channel of the stream and adjacent portions of the flood plain designated to carry the flow of the design flood, or the 100-year frequency flood in Alabama.

High Water Mark (HWM) -- The maximum observed and recorded height or elevation that floodwater reached during a storm, usually associated with the flood peak. The high water mark may be referenced to a particular building, bridge, or other landmark, or based on debris deposits on bridges, fences, or other evidence of the flood.

Low Bank -- The highest elevation at a specific stream channel cross section at which the flow in the stream can be contained in the channel without overflowing into adjacent overbank areas.

Low Point on Roadway -- The lowest elevation on a road profile usually in the vicinity of where the road crosses the stream. It is the first point on the roadway to be flooded.

Potential Flood -- A spontaneous event (natural phenomenon) capable of occurr ing from a combination of meterological, hydrological, and physical conditions; the magnitude of which is dependent upon specific combinations. See Flood and Flood Frequency.

Prime Farmlands -- Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. Land that may qualify as prime farmland could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.

Recurrence Interval -- The average interval of time expected to elapse between floods of a particular severity based on stage or discharge. Recurrence interval is generally expressed in years and is determined statistically

from actual or representative streamflows. Also see definition of <u>Flood Frequency</u>.

<u>Roadway at Crossing (Top)</u> -- The elevation of the roadway immediately above the stream channel. It may be higher than the low point of the roadway.

<u>Runoff</u> -- That part of precipitation which flows across the land and enters a perennial or intermittent stream.

<u>Stream Channel</u> -- A natural or artificial watercourse of perceptible extent, with definite bed and banks to confine and conduct flowing water continuously of periodically.

<u>Stream Channel Bottom</u> -- The lowest part of the stream channel (either in a constructed cross section or a natural channel). Bottom may be plotted and connected to provide a stream bottom profile.

<u>Stream Channel Flow</u> -- That water which is flowing within the limits of a defined watercourse.

<u>Stream Terrace</u> -- A flat or undulating plain bordering a flood plain. Terraces normally occur at higher elevations than flood plains and usually are either free from flooding or flooded less often than once every two years.

<u>Structural Bottom of Opening</u> -- The lowest point of a culvert or bridge opening with a constructed bottom through which a stream flows which could limit the stream channel bottom to that specific elevation. This structural

bottom may be covered with sediment or debris which further restricts the size of the opening.

<u>Top of Opening</u> -- The lowest point of a bridge, culvert or other structure over a river, stream or watercourse that limits the height of the opening through which water flows. This is referred to as "low steel" or "low chord" in some regions.

<u>Watershed</u> -- A drainage basin or area which collects and transmits runoff usually by means of streams and tributaries to the outlet of the basin.

<u>Watershed Boundary</u> -- The divide separating one drainage basin from another.

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